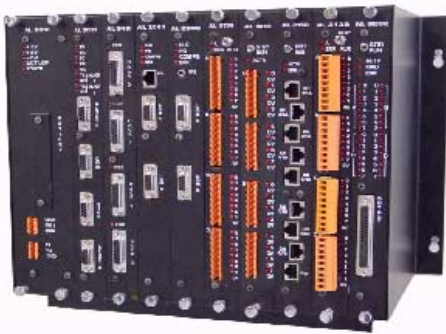


Product Description

The HD3002 Remote Terminal Unit (RTU), that is part of the Hadron Series, is a solution for control and supervision of generation, transmission and distribution electricity systems. It is a modular system, with flexible configuration, and composed of multiple processors. HD3002 RTU provides several options of input/output modules and communication protocols, allowing the use in applications with large number of I/O points.

Its main features are:

- Multiprocessors with multi-tasking operating system
- Communication with several operating centers
- Database with individual configuration for each operating center
- Master protocols for communication with IEDs (Intelligent Electronic Devices), as MODBUS RTU and DNP
- Slave protocols for communication with remote control centers, like DNP3 Ethernet and IEC 60870-5-104
- Simultaneous communication with multiple control centers
- Friendly configuration of all parameters by the software MasterTool Hadron XE
- Allows implementation of interlocking and controlling logics
- Synchronization through GPS (Global Positioning System) receivers
- Two communication serial ports incorporated on the RTU for configuration, maintenance and interface with local HMI or time adjustment through GPS receiver.
- Allows adding additional communication serial ports
- Acquisition and processing of digital and analog inputs with several options of electric interfaces to field signals
- Recording of events of variations in digital inputs with date and hour associated and resolution of 1 ms
- Digital commands with or without selection – SBO (Select Before Operate)
- Digital commands with or without and verification of hardware – CBO (Check Before Operate)
- Analog commands
- 16-bit analog inputs with calibration, digital parameterization and individually isolated and configurable channels
- Allows expansion of the RTU I/O capacity by using up to 4 expansion racks, in addition to the main rack



Hadron HD3002 RTU Supported Modules

Here are listed the CPUs, power supplies, communication interfaces, GPS synchronization and I/O modules.

The products are grouped by features, according to the last column. And the abbreviations used are:

CPU – Central Processing Unit

DI – Digital Input

AI – Analog Input

DO – Digital Output

AO – Analog Output

PSU – Power Supply Unit

Interface – Communication interface

Coproc – Coprocessor

Addit - Additional

Code	Description	Rack	Type
AL-2004	CPU to HD3002 RTU	Both	CPU
AL-2005	Real Time Multitasking Processor	Main	Coproc
AL-3511	Main Power Supply (19.2 to 57.6 Vdc)	Both	PSU
AL-3512	Main Power Supply (93.5 to 253 Vac, 100 to 300 Vdc)	Both	PSU
AL-3406	Master DP PROFIBUS Network Interface	Main	Interface
AL-3412	10-100 Mbits Ethernet Interface	Main	Interface
AL-3414	TCP MODBUS Ethernet Interface	Main	Interface
AL-3415	IEC 60870-5-104 Ethernet Interface	Main	Interface
AL-3416	Slave DP PROFIBUS Network Interface	Expansion	Interface
AL-3417	DNP3 Server Ethernet Interface	Main	Interface
AL-3150	16 isolated 16 bit AI (voltage/current) module	Both	AI
AL-3150/8	8 isolated 16 bit AI (voltage/current) module	Both	AI
AL-3151	16 isolated 16 bit AI (RTD/thermocouple) module	Both	AI
AL-3151/8	8 isolated 16 bit AI (RTD/thermocouple) module	Both	AI
AL-3130	32 DI (125Vdc)	Both	DI
AL-3132	32 DI (48Vdc)	Both	DI
AL-3138	32 DI (24Vdc)	Both	DI
AL-3202	32 CBO (Check Before Operate) relay DO module	Both	DO
AL-3490	Rack Blind Module	Both	Addit

Notes

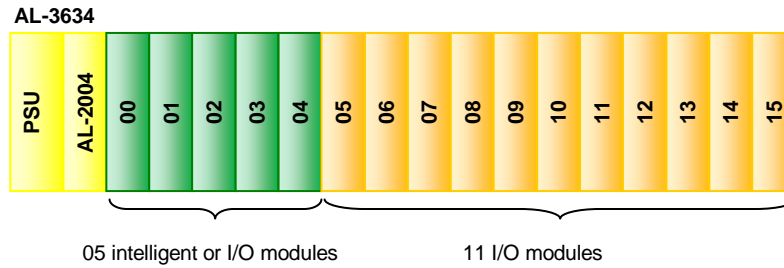
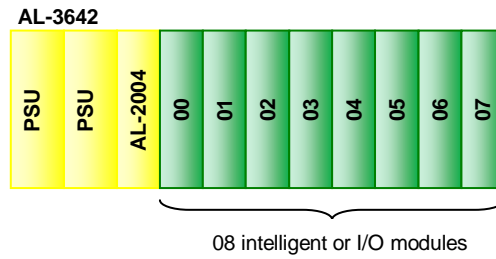
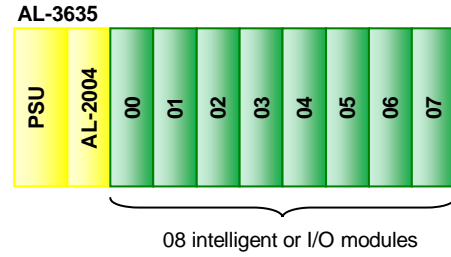
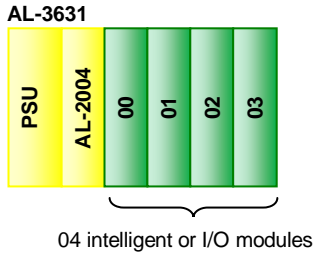
The technical details of all modules used must be checked in order to certify that they satisfies the application requirements.

Hadron HD3002 RTU Supported Racks

Racks are used to electrically interconnect modules. Available modules can be used both on main or expansion racks.

Code	Description
AL-3631	Rack for PSU, CPU and 4 intelligent modules
AL-3634	Rack for PSU, CPU and 5 intelligent modules and 11 I/O modules
AL-3635	Rack for PSU, CPU and 8 intelligent modules
AL-3642	Rack for PSU, CPU and 16 intelligent modules

Each RTU rack must have at least one power supply and one AL-2004 CPU. They have positions reserved on the rack. There are also reserved positions for intelligent modules and I/O modules. Reserved positions for intelligent modules can be used for both intelligent or I/O modules. Intelligent modules are modules used for communication interfaces and for co-processor modules.



Notes

The maximum number of modules in a rack depends of several factors. Some factors can restrict the maximum number of modules like: the maximum quantity of configurable modules, free positions to intelligent modules or current consumption in the rack. Intelligent and I/O modules stay always on the right of the CPU. The first position is always indicated as 00 (zero).

Power Supplies

The following models are available:

Code	Description
AL-3511	DC Input from 19,2 to 57,6 Vdc
AL-3512	AC Input from 93 to 253 Vac (47 to 63 Hz) or DC from 100 to 300 Vdc

CPU

The CPU (Central Processing Unit) controls the exchange of information between intelligent and I/O modules, and executes the user application when there's one. The user program and configuration are stored in the CPU. The AL-2004 is the only CPU available to use in the Hadron RTU.

ATTENTION:

The AL-3415/3417 interfaces are compatible with AL-2004 CPU version 3.04 or greater.

I/O Modules

Digital Inputs

There are three available digital input modules, all with the SOE function (*Sequence of Event*). The modules are:

Code	Description
AL-3130	32 digital inputs of 125 Vdc
AL-3132	32 digital inputs of 48 Vdc
AL-3138	32 digital inputs of 24 Vdc

Analog Inputs

There are four available analog input modules, all with isolated channels. The modules are:

Code	Description
AL-3150	16 V-I isolated analog inputs
AL-3150/8	8 V-I isolated analog inputs
AL-3151	16 RTD-thermocouple isolated analog inputs
AL-3151/8	8 RTD-thermocouple isolated analog inputs

Digital Outputs

For digital outputs, the available module is the AL-3202 which have features like SBO (*Select Before Operate*) and CBO (*Check Before Operate*).

Code	Description
AL-3202	32 NA Relay digital outputs of CBO (check-before-operate) type.

Others modules

Others I/O modules can also be used with Hadron HD3002 RTU, using PROFIBUS RTUs.

Intelligent Modules

AL-3406

DP-V0 PROFIBUS Master: Can be installed only in the main rack.

It is used to connection between the main rack and PROFIBUS networks. A Hadron HD3002 RTU can connect to up to three PROFIBUS networks as a master. One network is reserved exclusively for connection with expansion racks. Others two are used for connection with others remote PROFIBUS.

Each network uses a different AL-3406 module. It is necessary to use two AL-3406 modules for redundant networks.

AL-3416

DP-V0 PROFIBUS Slave: can be installed only in expansion racks. It allows connecting the expansion racks to the main rack. AL-3416 must be placed the in first positions in the rack. In the cases where the expansion racks have event recording modules (for example , AL-3138), there must be used two AL-3416 interface.

AL-3412

TCP ALNET II client/server communication interface with 100BASE-TX Ethernet interface. Can be installed only on main rack and restricts to one unit by rack.

AL-3414

TCP ALNET II, TCP MODBUS and RTU MODBUS over TCP Client/server communication interface, with 100BASE-TX Ethernet interface. Can be installed only in main rack.

AL-3414 can be used in redundant mode and, in this case, it must be used in pairs, installed in neighboring slots. In redundant mode, AL-3414 modules allocate same address IP, but only one stays active a time.

AL-3415

IEC 60870-5-104 server (slave) communication interface, with 100BASE-TX Ethernet interface. Up to four AL-3415/3417 modules can be installed on one main rack. Each module allows logic connection of up to four different IEC 60870-5-104 clients.

AL-3417

DNP3 server (slave) communication interface, with 100BASE-TX Ethernet interface. Up to four AL-3415/3417 modules can be installed on one main rack. Each module allows logic connection of up to four different DNP3 clients.

AL-2005

Co-processor that can be used as communication interface or advanced computation unit. On the Hadron HD3002 RTU, it's used mainly as a communication interface allowing installation of several serial communication drivers like RS-232C and RS-485 with speeds up to 38400 bps.

Others drivers can be used in AL-2005 module, however they must be configured manually.

Softwares

The following table lists the available softwares that can be used with the Hadron RTU:

Code	Description	Environment	Acquisition
HD8000	MasterTool Hadron XE	Windows™	Separately
AL-3860	AL-2005 Charger	Windows™	With AL-2005 module
AL-3865	ProfiTool	Windows™	With AL-3406 module
AL-2734	Master/Slave MODBUS Driver	AL-2005	Separately
AL-2743	Master DNP Driver	AL-2005	Separately

Ordering Information

Modules must be ordered separately. It is necessary to verify. To see a list of items related to modules or integrant items of a product, please refer to Technical Characteristics document of the product.

Product Features

General Features

Hadron HD3002 RTU	
Supported Protocols	<ul style="list-style-type: none"> • IEC 60870-5-104 Server (Slave) • DNP3 Ethernet Server (Slave) • DNP3 Serial Master • MODBUS RTU Serial Master • MODBUS RTU over TCP Master • TCP MODBUS Master Others protocols can be added manually.
Number of racks	01 main rack Up to 04 expansion racks
Synchronism	Optional by GPS or by DNP3 protocol
Accuracy in recording of events	1 ms for AL-3130, AL-3132 or AL-3138 modules CPU cycle time for the others points
CBO (<i>Check Before Operate</i>)	By AL-3202 module

Data Base Characteristics

Hadron HD3002 RTU	
Maximum number of communication points	5000 points per RTU
Maximum number of point groups	256 groups per RTU
Maximum number of point mappings for DNP3 and IEC 60870-5-104 clients	512 mapping groups per client 7680 mapping groups per RTU 20.000 mapped points per RTU
Maximum number of analog points with event detection	2.000 points per RTU
Maximum number of analog points with integral type dead band	500 points per RTU
Maximum number of engineering conversion points	500 points per RTU
Maximum number of alarm points	Up to 256 %M operands. Each %M operand can store up to 16 alarms.
Maximum number of counter points mapping in AL-3417	256 points per AL-3417
Maximum number of frozen counter points mapping in AL-3417	256 points per AL-3417

Versions

Some modules are compatible with the Hadron RTU only since a specific version, as described on the following table:

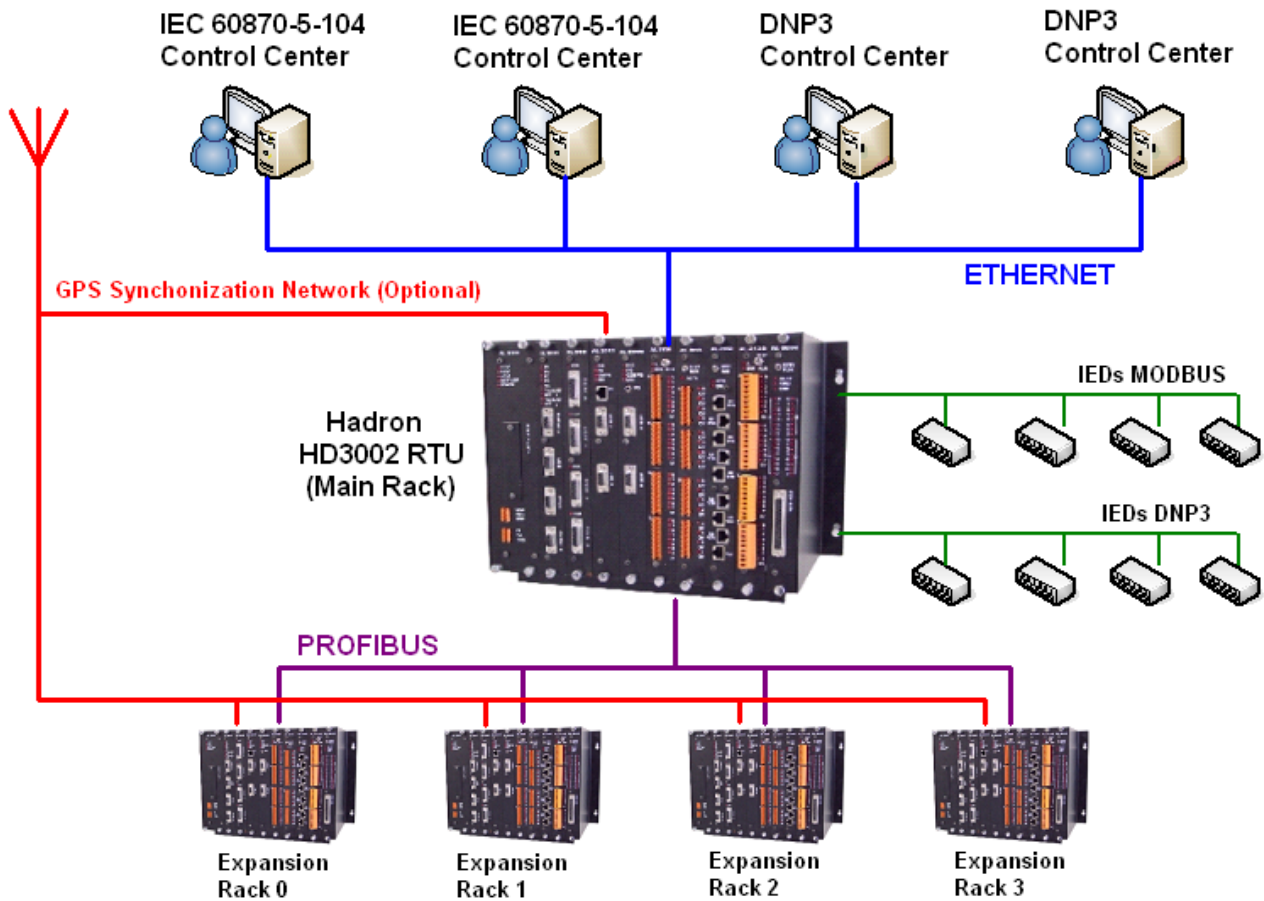
Hardware Modules		
Code	Description	Minimum version
AL-2004	CPU to HD3002 RTU	3.04
AL-2005	Real Time Multitasking Processor	3.00
AL-3406	Master DP PROFIBUS Network Interface	1.21
AL-3412	10-100 Mbits Ethernet Interface	1.04
AL-3414	TCP MODBUS Ethernet Interface	2.04
AL-3415	IEC 60870-5-104 Ethernet Interface	1.10
AL-3416	Slave DP PROFIBUS Network Interface	1.06
AL-3417	DNP3 Server Ethernet Interface	1.00
AL-3150	16 isolated 16 bit AI (voltage/current) module	2.10
AL-3150/8	8 isolated 16 bit AI (voltage/current) module	1.10
AL-3151	16 isolated 16 bit AI (RTD/thermocouple) module	2.10
AL-3151/8	8 isolated 16 bit AI (RTD/thermocouple) module	1.10
AL-3130	32 DI (125Vdc)	1.58
AL-3132	32 DI (48Vdc)	1.58
AL-3138	32 DI (24Vdc)	1.58
AL-3202	32 CBO (Check Before Operate) relay DO module	1.15

Software Modules		
Code	Description	Minimum version
HD8000	MasterTool Hadron XE	1.10
AL-2734	Master/Slave MODBUS Driver	3.01
AL-2743	Master DNP Driver	1.22

Architecture

The Hadron HD3002 RTU have a modular architecture with large expansion capacity, allowing the assembly from small RTUs to RTUs with more than 2,000 I/O points. Each RTU is composed of one main rack, where are installed the I/O modules, communication interfaces, co-processors and CPUs. The main rack can support up to four others racks, known as expansion racks, which are connected to main rack through a PROFIBUS network.

The PROFIBUS communicating network of the expansion rack can also be redundant, increasing the system reliability. Each rack can also be connected to a GPS synchronization network, allowing event recording with 1ms accuracy.



Installation

For technical details about installation and mechanical assembly of AL-3631, AL-3634, AL-3635 and AL-3642 racks, please consult the AL-2002/AL-2003/AL-2004 User's Manual.

Physical Dimensions

For details about physical dimensions, please consult each product technical characteristics.

Manuals

To further technical details about configuration, installation and programming of the product, the following documents must be consulted:

Document Code	Description	Language
MU207011	AL-2002/AL-2003/AL-2004 User's Manual	Portuguese
CT102438	AL-3130/3132/3138 Technical Characteristics	Portuguese
MU203013	AL-3150 / AL-3151 User's Manual	Portuguese
MU203014	AL-3202 User's Manual	Portuguese
MU207006	AL-2005 / RTMP User's Manual	Portuguese
MU202610	AL-3406 User's Manual	Portuguese
MU299026	PROFIBUS Network User's Manual	Portuguese
MU202001	AL-3416 User's Manual	Portuguese
MU202002	AL-3414 User's Manual	Portuguese
MU208302	HADRON HD3002 RTU User's Manual	Portuguese
MU208802	MasterTool Hadron XE HD8000 User's Manual	Portuguese
MU207103	AL-2734 User's Manual	Portuguese
MU207114	AL-2743 User's Manual	Portuguese
MU208352	HADRON HD3002 RTU User's Manual	English
MU208852	MasterTool Hadron XE HD8000 User's Manual	English